# REPORT ON ETHANOL PRODUCERS SURVEY

**PRESENTED AT THE CALIFORNIA PHASE 3**
**REFORMULATED GASOLINE REGULATION WORKSHOP**

**JUNE 15, 2000**

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**Chairman, Renewable Fuels Association Technical Committee**

# ETHANOL PRODUCERS SURVEY

**Requested by the Board of Directors of the Renewable Fuels Association (RFA).**

**Objective: To ascertain from producer reports the sulfur content of ethanol and certain hydrocarbons in the denaturants. This information will provide a basis for responding to the establishment of specifications for fuel ethanol by regulatory agencies.**

**Survey conducted during May and June, 2000 by Edward D. Heffernan, General Counsel of the RFA. There is a possibility of receiving additional reports and as they are received minor modifications will be made in the data.**

**All data reported has remained proprietary. Test results have been reported by the producer only to Mr. Heffernan who summarized the data and reported it to the RFA office.**

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**A questionnaire was sent to 43 companies that operate single or multiple fuel ethanol plants.**

**The questionnaire form asked for the sulfur content of the producer's undenatured and denatured ethanol. The sulfur, benzene, olefin and aromatic content of the denaturant used by the producer was also requested.**

**The respondents to the survey form sent single samples of undenatured ethanol, denatured ethanol and the denaturant to independent petroleum testing laboratories for analysis.**

**Test results were reported by the testing laboratory to the producer who then reported them to Mr. Heffernan.**

## ETHANOL PRODUCERS SURVEY

**Test Methods:**

**Sulfur in Ethanol ----------ASTM D5453**

**Sulfur in Denaturant ----------ASTM D2622**

**Benzene in Denaturant ----------ASTM D3606 or IR**

**Olefins in Denaturant ----------ASTM D1319**

**Aromatics in Denaturant ----------ASTM D5769**

**The information shown in the following table is based upon data received from 27 plants that have a total production capacity of 1.42 billion gal./yr. This response represents 81% of the 1.75 billion gallons of yearly production capacity of the ethanol industry.**

## INFORMATION REPORTED BY PRODUCERS

| Information Requested | Average | Range |
|---|---|---|
| Sulfur content of the undenatured ethanol | 2.9 ppm mass | 1 –11 ppm mass |
| Sulfur content of the denatured ethanol | 8.7 ppm mass | 2.1 – 27.2 ppm mass |
| Sulfur content of the currently used denaturant | 127.7 ppm mass | 9.1-733.9 ppm mass |
| Benzene content of the denaturant | 0.63 vol. % | 0.01 - 1.94 vol. % |
| Olefin content of the denaturant | 0.55 vol. % | 0.02 – 2.1 vol. % |
| Aromatic content of the denaturant | 1.33 vol. % | 0.05 – 6.6 vol. % |

Note: The above represents 81% of 1.75 billion gallons of yearly production capacity in the ethanol industry.

## ETHANOL PRODUCERS SURVEY

**The ethanol industry requires flexibility in the choice of denaturants. Currently nearly 100% of the denaturant used is natural gasoline. Other denaturants may be options in the future.**

**CaRFG3 gasoline is proposed to have a cap limit of 1.10% benzene, 10% olefins and 35% aromatics.**

**For producer flexibility, the benzene, olefin and aromatic limits in fuel ethanol should be set to allow for the possibility of using CaRFG3 gasoline as a denaturant.**

## ETHANOL PRODUCERS SURVEY

COMMENTS AND SUMMARY:

**The Renewable Fuels Association has completed a survey of the U.S. fuel ethanol producers. The RFA response to proposed specifications of key properties is based upon replies from companies representing 81% of the current fuel ethanol production capacity.**

**The test data reported represents only one sample from each reporting producer. It is not known how much variation in the reported values there would be over a long production period.**

**Also, the test method for sulfur ASTM D5453, does not include ethanol in the scope of applicability. Therefore, no precision for repeatability and reproducibility has been determined for the use of this method for total sulfur content in ethanol.**

**CARB is considering setting a lower sulfur standard for ethanol than for gasoline on the basis that ethanol is not a motor fuel but a fuel component. However, with Ed-85, ethanol is the motor fuel and gasoline is the blend component. It is appropriate that the sulfur standard (flat limit) for ethanol be the same as the average limit for gasoline.**

**A degree of tolerance must be incorporated into specifications based upon the reported numbers because of the lack of analytical data on multiple production samples and lack of precision information on the D5453 test method. Uniformity of the gasoline and ethanol specifications is also a factor.**

**Based upon the foregoing, the RFA suggests the following specifications for fuel ethanol that is blended to produce CaRFG3 gasoline:**

**Sulfur, max. ---------- 15 ppm mass**

**Benzene, max. ---------- 0.10 vol. %**

**Olefins, max. ---------- 0.50 vol. %**

**Aromatics, max. ---------- 1.70 vol. %**